

WHAT IS CLAIMED IS:

1. A lane recognition system for a vehicle,
2 comprising:
3 a camera set picking up a road image of a road
4 ahead of the vehicle;
5 a memory storing parameters representative of a
6 model lane marker of the road image; and
7 a controller coupled to the camera set and the
8 memory, the controller being arranged,
9 to set a plurality of lane-marker
10 candidate-point detecting areas on the road
11 image so that each one of the lane-marker
12 candidate-point detecting areas is partially
13 overlapped with the lane-marker candidate-point
14 detecting areas adjacent to the one of the
15 lane-marker candidate-point detecting areas,
16 to detect each lane marker candidate point
17 in each lane-marker candidate-point detecting
18 area,
19 to calculate variations of the parameters
20 by comparing the lane marker candidate points
21 with corresponding points on the model lane
22 marker derived from the parameters stored in
23 the memory,
24 to correct the parameters according to the
25 variation,
26 to output road-shape indicative
27 information on the basis of the parameters.

1 2. The lane recognition system as claimed in claim
2 1, wherein the controller sets each lane-marker
3 candidate-point detecting area so that in an x-y
4 coordinate system of the road image, the

5 y-coordinate of each lane-marker candidate-point
6 detecting area is overlapped with the y-coordinate
7 of the adjacent lane-marker candidate-point
8 detecting area by a line.

1 3. The lane recognition system as claimed in claim
2 1, wherein the variations calculated by the
3 controller includes a variation of a road curvature
4 and a displacement of the camera set relative to a
5 reference position.

1 4. The lane recognition system as claimed in claim
2 1, further comprising a sensor unit that detects a
3 behavior of the vehicle and a vehicle control
4 apparatus that controls the vehicle according to a
5 command signal outputted from the controller.

1 5. The lane recognition system as claimed in claim
2 4, wherein when the controller determines that the
3 corrected parameters are normal based on the result
4 of comparing information derived from the corrected
5 parameters with the vehicle behavior detected by the
6 sensor unit, the controller updates the parameters
7 in the memory are updated.

1 6. The system as claimed in claim 4, wherein the
2 controller is further arranged to obtain a
3 coordinate of each lane-marker candidate-point
4 detecting area by transforming a coordinate system
5 of the road ahead of the vehicle into a coordinate
6 system of the road image, and to detect a coordinate
7 of each lane marker candidate point in the
8 coordinate system of the road image.

1 7. The system as claimed in claim 4, wherein the
2 controller is further arranged to detect the lane
3 marker candidate point in each lane-marker
4 candidate-point detecting area by selecting a
5 lane-marker indicative straight line element between
6 a first point on an upper side of each lane-marker
7 candidate-point detecting area and a second point on
8 an lower side of each lane-marker candidate-point
9 detecting area and by determining one of the first
10 and second points as a lane-marker candidate point
11 of each lane-marker candidate-point.

1 8. The system as claimed in claim 7, wherein the
2 controller is further arranged to output the
3 variation indicative of a displacement of the
4 vehicle relative to a reference point of the road to
5 the vehicle control apparatus.

1 9. The system as claimed in claim 7, wherein the
2 controller is further arranged to adjust the second
3 point of the lane-marker candidate-point detecting
4 area with a first point of the adjacent lane-marker
5 candidate-point detecting area adjacent to the lane
6 marker candidate point.

1 10. The system as claimed in claim 1, wherein when
2 the lane markers are recognized as a pair of lane
3 markers for defining a lane, each of the lane-marker
4 candidate-point detecting areas of each lane marker
5 is overlapped with the adjacent lane-marker
6 candidate-point detecting areas by a line.

1 11. The system as claimed in claim 1, wherein when
2 the controller detects no candidate point at one of
3 the lane-marker candidate-point detecting areas, the
4 controller calculates the candidate point of the one
5 of the lane-marker candidate-point detecting areas
6 on the basis of the adjacent lane-marker
7 candidate-point detecting areas adjacent to the one
8 of the lane-marker candidate-point detecting area.

1 12. The lane recognition system as claimed in claim
2 1, wherein the controller sets the lane-marker
3 candidate-point detecting areas so that the model
4 lane markers are located at centers of the
5 respective lane-marker candidate-point detecting
6 areas.

1 13. The lane recognition system as claimed in claim
2 1, wherein the controller sets the lane-marker
3 candidate-point detecting areas at positions offset
4 from the model lane marker according to the change
5 of the past model lane marker.

1 14. A method for recognizing a lane traveled by a
2 vehicle, the method comprising:

3 picking up a road image of a road ahead of the
4 vehicle;

5 storing parameters of a model lane marker of
6 the road image;

7 setting a plurality of lane-marker
8 candidate-point detecting areas on the road image so
9 that each one of the lane-marker candidate-point
10 detecting areas is partially overlapped with the
11 lane-marker candidate-point detecting areas adjacent

12 to the one of the lane-marker candidate-point
13 detecting areas;
14 detecting each lane marker candidate point in
15 each lane-marker candidate-point detecting area;
16 calculating variations of the parameters by
17 comparing the lane marker candidate points with
18 corresponding points on the model lane marker
19 derived from the parameters stored in a memory;
20 correcting the parameters according to the
21 variation; and
22 outputting road-shape indicative information on
23 the basis of the parameters.

1 15. A lane recognition system installed on a
2 vehicle, comprising:
3 image pickup means for picking up an image of a
4 predetermined region ahead of the vehicle;
5 storing means for storing parameters of a model
6 lane marker;
7 coordinate transforming means for obtaining a
8 coordinate of each lane-marker candidate-point
9 detecting area by transforming a coordinate system
10 of the road ahead of the vehicle into a coordinate
11 system of the road image;
12 lane-marker candidate-point detecting area
13 setting means for setting a plurality of lane-marker
14 candidate-point detecting areas on the image to
15 detect a lane marker of a lane traveled by the
16 vehicle;
17 lane-marker candidate-point detecting means for
18 detecting a coordinate of each lane-marker
19 candidate-point in each lane-marker candidate-point
20 detecting area;

21 variation calculating means for calculating
22 variations of the parameters representative of the
23 road shape and a position of the image pickup means
24 relative to the road ahead of the vehicle by
25 comparing the coordinate of the lane marker
26 candidate point and a coordinate of a point of the
27 road model in the coordinate system of the image;
28 parameter updating means for updating the
29 parameters stored in the storing means according to
30 the variations of the parameters; and
31 output signal selecting means for outputting a
32 displacement of the vehicle relative to the road to
33 a vehicle control apparatus;
34 wherein the lane-marker candidate-point
35 detection area setting means sets the lane-marker
36 candidate-point detection areas so that a part of
37 each lane-marker candidate-point detection area is
38 overlapped with adjacent one of the lane-marker
39 candidate-point detection areas;
40 wherein the lane-marker candidate-point
41 detecting means detects a straight line element of
42 the lane marker on the basis of a coordinate of a
43 first point set at a position of one of upper and
44 lower sides of the lane-marker candidate-point
45 detecting area and a coordinate of a second point
46 set at a position of the other of the upper and
47 lower sides of the lane-marker candidate-point
48 detecting area;
49 wherein the lane-marker candidate-point
50 detecting means outputs the point corresponding to
51 one of the upper and lower sides of the lane-marker
52 candidate-point detecting area as a lane-marker
53 candidate point.